

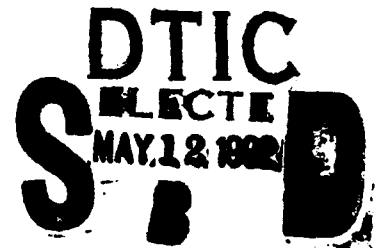
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**OCEANOGRAPHIC
DATA DICTIONARY
FOR
netCDF FILES**



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A. Louise Perkins

Abstract

This document presents a data dictionary for oceanographic netCDF data files. Commonly used words are abbreviated. Abbreviations are then combined to make sentence-like variable names that describe the contents of the variable. The goal is to facilitate netCDF file use by making the CDF form of the data self-documenting.

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1.0 INTRODUCTION

The netCDF file-program interface (Rew [3]) provides a machine independent view of data files. To simplify the file-human interface, a few basic utilities (re: ncdump, ncgen) are provided. They allow people to peruse the data file in a readable fashion via the Common Data Language (CDL). This dictionary is an addendum to CDL, proposing standard abbreviations that describe the contents of the data files without further references needed. It is an attempt to make the CDL form of the netCDF files self-documenting. It is based on the NEPRF Data Dictionary [2].

2.0 DATA DICTIONARY

This section presents the data dictionary. All words are abbreviated to four or less letters. Less than four is acceptable only for words less than four letters, or for well-established, commonly-accepted abbreviations. The abbreviations selected followed some general guidelines. The first guideline was to drop all vowels when possible, except when the first letter is a vowel. We rarely drop the first letter in the word unless it is a number or a commonly-used English language abbreviation. If we still need more reduction, we next pick the most important consonants to retain. Third, a visual inspection for readability was used.

The shorter abbreviations are three or less letters. It is possible to have a hierarchy of shorter abbreviations. We first tried to shorten an abbreviation by removing letters from the end of the long abbreviation. When this was not unique, we retained the dominant sounds of the accented (stressed) syllables in the Institute for Naval Oceanography (INO) Technical Memo entitled Software Requirements Document for the netCDF Interface with ECMOP, Version 1.0 [4].

The type field is keyed:

- attr - attribute
- bvar - bit or logical variable
- cvar - character variable
- desc - description

gvar - generic variable
 ivar - integer variable
 op - operation
 rvar - real variable
 unit - unit of measure

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
abbreviated	abbr	abr,ab	desc
absolute	abs	al	op
access	acc	as	op
acoustic	acst	ac	attr
action	actn	atn,an	op
active	actv	av	desc
adjoint	adjt	aj	op
advection	advc	ad,a	rvar
age	age	- -	attr
agency	agcy	agc	desc
air	air	ai	rvar
altimetry	altm	al	attr
amount	amt	am	desc
anemometer	anmt	anm	attr
angle	ang	ag	op
anomaly	anom	- -	desc
ansi	ansi	- -	desc
area	area	ar	op
array	arry	ara	desc
ascending	asc	- -	attr
assimilation	assm	ass,as	op
associative	assc	act	op
atmosphere	atms	af	attr
attached	att	- -	desc
attribute	attr	at	attr
avhrr	avhr	- -	attr Adv. Very Hi Resol. Radiometer
background	bkgr	- -	attr
band	band	- -	attr
bandwidth	bdwh	- -	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
baroclinic	bcnc	bc	attr
barotropic	btpc	bt	attr
base	base	- -	desc
beaufort	bfrt	- -	attr Beaufort wind strength
becomes	bcom	- -	op
begin	bgn	b	desc
biology	biol	- -	desc
bit	bit	- -	desc
bitstream	bstr	- -	bvar
bogus	bgus	bgs	desc
boresight	bors	- -	attr sensor orientation
bottom	bot	bm	desc
boundary	bdry	bd	desc edge or limits
brightness	brgt	- -	rvar luminance
byte	byte	- -	desc
calculate	calc	- -	op
calls	call	- -	op
callsign	csgn	- -	attr call-sign of station or ship
calm	calm	- -	desc
catalog	cat	- -	desc descriptive list of options
category	catg	- -	desc division of classification
cell	cell	- -	desc
celsius	cels	ce	attr
center	cntr	- -	desc
change	chg	- -	desc modification or alteration
channel	chan	- -	attr
characteristic	chr	- -	desc
charge	chrg	- -	- -
cirrus	cirr	ci	desc type of high cloud
classification	clas	- -	desc systematic organization
clear	clr	- -	desc
climatology	clmo	cmo	attr data pertaining to climate
cloud	cld	- -	desc
cm	cm	- -	attr central memory
coast	cst	- -	attr
code	code	cd	op an encoding

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
coefficient	coef	c	gvar
column	col	- -	desc
command	cmd	- -	op order or instruction
comment	cmt	- -	desc
common	com	- -	desc
compilation	cmpl	- -	op
complexity	cplx	- -	op
component	cmp	- -	attr
computer	cptr	- -	desc
concentration	conc	- -	attr
condition	cond	- -	desc restricting or modifying factor
conditional	cndl	- -	op
confidence	cnfi	- -	attr degree of certainty
constant	cnst	- -	attr
contains	cntn	- -	op
continuous	cont	- -	desc
contour	cntr	- -	desc isoline
control	ctrl	- -	desc
convective	conv	- -	rvec
convergence	cnvg	- -	op
conversion	cnvn	- -	op transformation between states
copies	copy	- -	op
Coriolis	corl	cor,cl	op
correction	corr	- -	op to meet a standard
count	cnt	- -	attr Numeric value for cardinality
country	ctry	- -	desc
coverage	cvrq	- -	desc extent of coverage
cp	cp	- -	desc central processor
creates	cre	- -	op
creation	crtn	- -	op
criticality	crit	- -	desc
crossection	xsct	- -	op
crossreference	xref	- -	op
cube	cube	cb	desc
current	curr	- -	rvar
curvature	curv	- -	rvar

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
cycle	cyc	- -	ivar
dampen	damp	- -	op
data	data	d	gvar
date	date	dt	attr time in days
day	day	- -	attr
decay	decy	dcy	- -
deck	deck	- -	desc of punched cards
decode	dcd	- -	op
deep	deep	- -	rvar
delayed	dlyd	- -	op
density	dens	dn	rvar
depth	dpth	dph,dp	rvar
depression	dprs	- -	rvar a curvature upwards
descending	dsd	- -	op
describes	dscr	- -	desc
description	dsc	- -	desc Textual appendage
destination	dest	- -	desc
device	dev	- -	desc
dewpoint	dwpt	- -	rvar
diameter	dia	- -	rvar
dictionary	dict	- -	desc
difference	dif	df	op
diffusivity	diff	di	op
dimension	dim	dm	desc
direction	dir	- -	desc
directory	drct	- -	desc
disk	dsk	- -	desc
displacement	dspl	- -	rvar
disposition	disp	- -	desc
distance	dis	ds	rvar
distribution	dist	- -	desc
diurnal	drnl	- -	desc
domain	dom	- -	desc limits of variable
Dopler	dplr	- -	desc
east	e	- -	desc
echo	echo	- -	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
eddy	eddy	ey	desc
effective	eff	- -	desc
elapsed	elps	- -	desc
elevation	elev	elv,ev	rvar
end	end	ed	desc
energy	engy	- -	rvar
executable	xqt	xq	desc
executes	exec	- -	op
expanded	xpnd	- -	desc
external	xtnl	xt	desc
factor	fctr	ftr,fr	attr
fine	fine	- -	desc
first	1	- -	desc
flag	flag	fl	desc boolean flag
float	flot	flt	desc
flux	flux	f	rvar
formal	frml	- -	desc
friction	frct	frc	rvar
front	frnt	- -	desc
full	full	- -	desc
function	func	fun,fc	op
geographic	geog	- -	desc taxonomy of surface of earth
geosat	gsat	- -	desc
get	get	gt	op
GHz	ghz	gh	attr
global	glbl	- -	desc worldwide, comprehensive
gravity	grvt	gvt	rvar
grid	grid	gr,g	desc
ground	grnd	- -	desc surface of earth
gt	gt	- -	op greater than
guess	gues	- -	op estimation
heat	heat	he	rvar
heavy	hvy	- -	desc
height	ht	- -	rvar
hertz	hz	h	attr
high	hi	- -	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
horizontal	horz	--	desc
hour	hour	--	rvar
hydrography	hydr	--	attr
identity	id	--	desc ident. for object or attribute
image	imge	im	desc
inactive	inac	--	desc
index	indx	ix	desc
influence	infl	if	desc
information	info	--	desc
infrared	infr	--	attr
ingest	ngst	--	op
input	iput	ip	op
insertion	isrt	in	op
instaneous	inst	--	desc
instruction	inst	itr	op
internal	itnl	it	desc
interval	itvl	ivl,il,i	desc
inverted	inv	iv,v	op
ir	ir	--	attr infra-red
is	is	--	desc exists
isentropic	isnt	--	desc equal potential temperature
isobaric	isbr	--	desc
kilogram	kilo	kg	unit
kinematic	knmt	--	desc
Lagrangian	lagn	--	attr
land	land	lnd	desc
last	last	--	desc
latent	ltnt	--	desc
latitude	lat	--	rvar
left	left	l	desc
length	lnth	--	gvar
level	lvl	lv	desc
light	lit	--	desc
list	list	--	desc any list of words or numerals
lit	lit	--	attr info about lit data
load	load	--	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
location	lctn	- -	desc
logical	logc	lg	desc
long	long	- -	- -
longitude	lon	- -	rvar
low	low	lw	desc
lt	lt	- -	op less than
lu	lu	- -	desc logical unit
maps	maps	mps	op
marine	marn	- -	desc
mask	mask	msk,ms	op
mass	mass	- -	rvar
matches	mtch	- -	op
maximum	max	- -	op
mean	mean	mn	op
meander	mand	- -	desc
meters	mtrs	mtr,mr	unit
method	mthd	mt	attr
middle	mid	m	desc
millibar	mb	- -	attr
minimum	min	- -	op
minutes	mnts	- -	attr
missing	miss	- -	desc
mixed	mixd	- -	desc
model	modl	mdl	desc
modifies	mdfy	- -	op
molecular	mlcr	- -	attr
momentum	mmtm	mm	rvar
moored	mord	- -	attr
nadir	ndr	- -	desc point below surface observation
name	name	- -	desc literal value of object
next	next	- -	desc
north	n	- -	desc 0 degrees
northeast	ne	- -	desc 45 degrees
northwest	nw	- -	desc 315 degrees
not	not	- -	op
nudging	nudg	ndg,ng	op

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
number	num	nu	ivar index into series of objects
numeric	nmrc	nmc	desc
observation	ob	o	desc
occupies	occp	- -	desc
ocean	ocn	- -	desc
oe	oe	- -	attr info about orbital element
operational	oper	- -	desc
operator	op	- -	attr operation to perform
ordinal	ord	- -	desc
output	oput	op	op
particle	prtc	pc	desc
past	past	- -	desc
path	path	pth,ph	desc
per	per	pe	op
period	perd	- -	desc duration of interval event
permanent	perm	- -	desc
pk	pk	- -	desc acronym - primary key
point	pt	- -	desc
points	pts	P	desc
precipitable	prcl	- -	desc
present	prst	- -	desc
pressure	pres	- -	rvar
prevailing	prvl	pr	desc
previous	prev	pv	desc
primary	prim	- -	desc
print	prnt	prt	op
probability	prbl	- -	op
profiles	prof	prf,pf	desc
put	put	- -	op
q	q	- -	desc terrain resolution
qualitative	qltv	- -	desc
radiation	rdtn	- -	rvar
radius	rad	ra	rvar
Rafos	rafs	raf	desc
ramp	ramp	- -	op
random	rndm	- -	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
range	rang	- -	desc
rate	rate	rat	desc
read	read	rd	op
references	ref	- -	desc
relative	rltv	- -	desc
remark	rmrk	- -	desc addendum for clarity
report	rpt	- -	desc
request	rqst	rq	op
requester	reqr	- -	desc
requires	req	- -	desc
research	rsch	- -	desc
resembles	rsmb	- -	desc
resolution	rslt	- -	desc
responsible	resp	- -	desc
return	rtn	rt	op
right	rht	r	desc
Rossby	rsby	- -	desc
salinity	salt	sal,sl	rvar
satellite	sat	st	attr
save	save	sv	op
scale	scl	sc	op
sea	sea	se	desc
second	2	- -	desc
secondary	scdy	- -	desc
seconds	sec	- -	desc
sensible	snsb	- -	desc
sensor	sens	- -	desc
shallow	shlw	- -	desc
shear	shr	- -	rvar
ship	ship	- -	desc
sigma	sgma	- -	rvar
significant	sig	- -	desc
simple	smpl	sp	desc
size	size	sz	attr
smooth	smth	- -	desc
solar	sol	- -	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
sonic	snc	- -	desc
sounder	sndr	- -	desc
sounding	sndg	- -	desc
south	s	- -	desc 180 degrees
southeast	se	- -	desc 135 degrees
southwest	sw	- -	desc 225 degrees
space	spc	- -	desc
spawns	spwn	- -	op
speed	spd	- -	rvar
squared	sqrd	sq	op
start	strt	- -	desc
station	stn	- -	desc
step	step	- -	desc
stream	strm	- -	desc
stress	strs	str	rvar
subjective	sbj	- -	desc
subordinate	sub	- -	desc
subset	sbst	ss	desc
sum	sum	- -	op
superior	supr	- -	desc
surface	surf	sf	desc
Sverdrup	sver	- -	attr
temperature	temp	tp	rvar
temporary	tmp	- -	desc
terrain	terr	- -	desc
text	text	txt	desc qualitative info. in text
thermocline	thcl	- -	desc
third	3	- -	desc
threshold	thld	- -	desc
time	tm	t	desc absolute time
topography	topo	- -	desc
total	totl	ttl	desc
track	trck	tk	desc
transformation	trfm	- -	op
transient	trns	- -	desc
transport	tprt	- -	desc

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
turbulence	trbl	trb,tl	desc
type	type	ty	attr selection from a category
u	v1dm	- -	rvar velocity in first dimension
ucomponent	ucmp	- -	desc
unexpanded	unxp	- -	desc
unit	unit	u	desc
units	unts	us	desc
update	updt	ud	op
upper	uppr	up	desc
urban	urbn	urb	desc
uses	use	- -	desc
usn	usn	- -	desc US Navy
v	v2dm	- -	rvar velocity in second dimension
valid	vald	- -	desc
value	val	- -	desc numeric represent. of quantity
variable	vrbl	vb	desc
variance	var	- -	desc
vcomponent	vcmp	- -	desc
velocity	vel	v	rvar
vertical	vert	vr	desc
viscosity	visc	vs	rvar
visible	vis	- -	desc
vorticity	vort	- -	rvar
w	v3dm	- -	rvar velocity in third dimension
warming	wrmg	- -	desc
water	wtr	- -	desc
wave	wav	- -	desc
wban	wban	- -	desc weather bureau Air Force Navy
weather	wthr	- -	desc
weight	wght	w t	desc
west	w	- -	desc 270 degrees
wetbulb	wetb	- -	attr wetbulb thermometer
whitecap	wcap	- -	desc crest of wave is foam
width	wdth	- -	desc
wind	wind	wnd	rvar
wmo	wmo	- -	desc World Meteoro. Organization

<u>Full Name</u>	<u>Abbr Name</u>	<u>Short</u>	<u>Type Description</u>
word	word	- -	desc
write	wrt	w r	op
xtom	xtom	- -	desc computation excludes toms
yaw	yaw	- -	op rotation about vertical axis
year	year	yr	desc
zenith	zen	- -	desc vertically above observation
zonal	znl	- -	desc
zone	zone	- -	desc

3.0 netCDF JACKETS

The netCDF jackets are responsible for mapping model variable names to the netCDF long and short abbreviated names given in the data dictionary. Complex names, consisting of underscore-concatenated long form abbreviations, are used for the netCDF file variable names whenever possible. Short-form abbreviations are concatenated without the underscore. In length-limited programming languages, the shorter abbreviations are used in the netCDF file.

4.0 SEMI-SPECTRAL PRIMITIVE EQUATION MODEL (SPEM) netCDF EXAMPLE

This section includes the currently defined mappings for SPEM [1]. We map the SPEM variable names, which are listed in the column "model", to the "Short-form" column abbreviations available in the netCDF file because SPEM is a FORTRAN program.

<u>Model</u>	<u>Long netCDF</u>	<u>Short netCDF</u>	<u>Description</u>
disp	flag_dcd	fldcd	- -
dt	time_step	dt	- -
dtyp	data_type	dty	- -
h	ht	ht	- -
idat	date	date	- -
ipre	flag_prev	flpr	- -

<u>Model</u>	<u>Long netCDF</u>	<u>Short netCDF</u>	<u>Description</u>
irc	flag_rtn_code	flrtcd	- -
irng	data_iflc	diflc	- -
irpt	logc_unit_rpt	lurpt	- -
irw	flag_rd_wrt	flrdwr	- -
irptr	dens_ob_lctn_1_dim	dn1odm	- -
isave	flag_save	flsv	- -
iupd	flag_updt	flud	- -
iuptr	1_dim_vel_ob_lctn_1_dim	v11odm	- -
ivptr	2_dim_vel_ob_lctn_1_dim	v21odm	- -
ixb	arry_size_bgn_1_dim	b1dm	- -
ixe	arry_size_end_1_dim	ed1dm	- -
iyb	arry_size_bgn_2_dim	b2dm	- -
iye	arry_size_end_2_dim	ed2dm	- -
izb	arry_size_bgn_3_dim	b3dm	- -
ize	arry_size_end_3_dim	ed3dm	- -
jrptr	dens_ob_lctn_2_dim	dn2odm	- -
juptr	1_dim_vel_ob_lctn_2_dim	v12odm	- -
jpvr	2_dim_vel_ob_lctn_2_dim	v22odm	- -
krptr	dens_ob_lctn_3_dim	dn3odm	- -
kuptr	1_dim_vel_ob_lctn_3_dim	v13odm	- -
kvptr	2_dim_vel_ob_lctn_3_dim	v23odm	- -
l	1_dim_grid_size	1dmgr	- -
loca	lctn	lctn	- -
m	2_dim_grid_size	2dmgr	- -
mtppt	max_topo_size	toposz	- -
n	3_dim_grid_size	gr3dm	- -
nptlg	num_pts_lon	nplon	grid_size
nptlt	num_pts_lat	nplat	grid_size
numr	dens_ob_size	dnodm	- -
numu	1_dim_vel_ob_size	v1odm	- -
numv	2_dim_vel_ob_size	v2odm	- -
psi	vort	vort	- -
rampuv	per	per	period to interpolate thru
rcim	dens_clmo	dncimo	- -
rdata	dens_data	dnd	- -

<u>Model</u>	<u>Long netCDF</u>	<u>Short netCDF</u>	<u>Description</u>
rdcy	arry_data_iflc	aradif	- -
resol	rslt	rslt	- -
rho	dens	dens	- -
rlllt	low_left_lat	lwllat	coverage, geographic_location
rllng	low_left_lon	lwllon	coverage, geographic_location
robs	dens_ob	dno	- -
ros2	cnst_rsby_rad	rsbyrd	Rossby radius
rrdec	dens_coef_assm	dncas	- -
rudec	1_dim_vel_coef_assm	v1cas	- -
rvdec	2_dim_vel_coef_assm	v2cas	- -
scalf	scl_fctr	sclftr	- -
ssbathy	sbst_toposstopo	- -	- -
ssllg	sbst_low_left_lon	sslwl1	domain_values or coverage
sslllt	sbst_low_left_lat	sslwl2	domain_values or coverage
ssurlg	sbst_uppr_rht_lon	ssupr1	domain_values or coverage
ssurlt	sbst_uppr_rht_lat	ssupr2	domain_values or coverage
t	curr_tm	currtm	- -
tdata	elps_tm	elpstm	time since last data assimilation
tobs	ob_tm	obtm	- -
u	1_dim_vel	v1dm	- -
uclm	1_dim_vel_clmo	v1dmcl	- -
udata	1_dim_vel_data	v1dmd	- -
uobs	1_dim_vel_ob	v1dob	- -
urlat	uppr_rht_lat	uprlat	- -
urlng	uppr_rht_lon	uprlon	- -
v	2_dim_vel	v2dm	- -
vdata	2_dim_vel_data	v2dmd	- -
vclm	2_dim_vel_clmo	v2dmcl	- -
vobs	2_dim_vel_ob	v2dob	- -
w	3_dim_vel	v3dm	- -

5.0 DATA SPACE

There are many "standard" data structures in data space. The best structure for each data type with respect to storage, retrieval, and update

needs are still open issues. In this section, with an eye towards the future, we set down the contents of groups of data by collection instruments. The instrument is listed and then some of the data types we might expect to be associated with that instrument are listed under it.

When a data-type abbreviation is so familiar as to be a default name, it is used instead of a sentence. One might consider these idioms.

ADP:

acst_dplr_prof (adp)
vel_prof_vert (vprfvr)

CTD:

curr_temp_dens (ctd)

Gross Feature Locations (Bogus Maps):

mndr
eddy
frnt_trak (frnttk)

Hydrography:

Hydr
sea_surf_ht (ssh)
sea_surf_temp (sst)

Inverted Echo Sounders:

inv_echo_sndr (ies)
sea_surf_ht (ssh)

Path Characteristics:

path_char (pthchr)
dspl
ang_prtc_path (agpcph)
curvature (curv)

Satellite Altimetry:

sat_altm (satal)
sea_surf_ht (ssh)
infr (infr)

VTP:

vel_temp_pres (vtp)

6.0 CONSTANT VALUES

For actual numbers, the value can be concatenated with the unit or type. For example 10 - *minutes*, or the associated short form 10*mnts*, can be used for a constant time value of ten minutes.

7.0 CONSTRAINTS ON DATA ITEMS

Some words are not allowed because other words are equivalent and "better" in some sense. The following words are *not* to be added to the data dictionary in Section 2:

altitude	use height or elevation
average	use mean
datetime	use time
definition	use description
increment	use interval
mode	use description or type
quantity	use amount

8.0 VALIDATION CRITERIA

This section discusses how we will know that the netCDF data dictionary, utilities, and subroutines are performing correctly. It will be the basis for the system tests.

8.1 Performance Bounds

The netCDF interfaces must add no more than twenty percent overhead to the model run, and we would like to see no more than five percent.

An associated software report routine will be called to document each netCDF activity to disk. This report will document that the communications we expected to take place did in fact occur.

8.2 Test Cases

Our timing test case will run the models with and without the netCDF interface, and time the run costs of each to determine the percentage of overhead. This will be done averaged over five separate overall tests to subtract out system load affects, and over five separate cases for each module interface.

The software results should be equivalent in all respects, except performance, up to the level of precision used by the netCDF file format.

9.0 BIBLIOGRAPHY

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